Description of the proposed project work

- I would like to discuss possible dvelopments of the research done in my recent paper "Algebraic Nijenhuis operators and Kronecker Poisson pencils" (ArXiv: math.DG/0504337). In this paper Poisson pencils on $\mathfrak{g}^*$ which arise from algebraic Nijenhuis operators on $\mathfrak{g}$, where $\mathfrak{g}$ is a Lie algebra, are studied. Namely, a criterion of the kroneckerity of such a pencil is established which can be applied to constructing completely integrable systems. In particular this technique is applied to obtain a proof of the complete integrability of the free rigid body system on $\mathfrak{gl}_n$ alternative to the classical one. Another application is an example of a completely integrable system associated to any split semisimple Lie algebra and a Borel subalgebra in it.

- The method described has some restrictions and in the frames of the proposed project I would like to discuss possibilities to develop it in the following two directions.

  1. Use weak Nijenhuis operators instead of Nijenhuis ones. It is known that with any weak Nijenhuis operator one can associate a Poisson pencil. Then one can ask again whether it is kronecker.
  2. Examine the possibility to generalize the method to the Poisson pencils on $T^*(G/H)/G$ (instead of $\mathfrak{g}^* \cong T^*G/G$) arising from left invariant Nijenhuis operators on a homogeneous space G/H.

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